Green manufacturing

R. Oechsner
Head Section Energy Technology
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Biography
Richard Öchsner received the M.S. (Dipl.-Ing.) degree in Electrical Engineering and the Dr.-Ing. degree from the University of Erlangen. Since 1991 he is with Fraunhofer IISB and working in the department Semiconductor Manufacturing Equipment and Methods as deputy head of department and leads the group Manufacturing Control and Productivity. He was engaged in the fields of semiconductor equipment assessment, contamination control in equip-ment, equipment control, integrated metrology, advanced process control, manufacturing methods, optimization, productivity and energy efficiency. Since 2012 he is head of section energy technology and working on energy concepts covering creation, storage, distribution and efficient use of energy. Richard Öchsner was/is involved in several European and national co-operative R&D projects also as coordinator. He was active in SEMI standardization and a member of the Factory Integration TWG within ITRS (International Technology Roadmap for Semiconductors).

Next step in electrical power consumption reduction.

P. Colin
Global Product Manager
Pfeiffer Vacuum, Annecy, France

Abstract
Several reports or benchmarks have already shown the significant overall power consumption impact of pumps and abatements in Semiconductor fabs. Many accomplishments and evolutions were achieved for pumps and abatements dedicated to clean and light processes. However the harsh process segment (CVD, Diffusion...) has not seen major improvements from sub-fab components. The next step for pump and abatement power consumption reduction is in these departments. These harsh application targets create challenges for power reductions as the process trend is to have increased gas flows and higher pumping speeds requiring larger pumps. Another challenge is the use of new gases and chemistries requiring more powerful pumps. Our study has demonstrated with an accurate dedicated harsh product design, the real pump and abatement power consumption impact can be drastically reduced without risk for the process.

Biography
Patrick Colin obtained a master degree in mechanical and electrical engineering (Dipl.-Ing.) at Ecole Nationale Supérieur d'Electricité et de Mécanique of Nancy, France in 1994 - since 1995 he has held several positions in adixen Vacuum Products (Pfeiffer Group). He first worked in R&D to develop high efficiency monitoring for vacuum pumps. After 5 years as Dry pumps Product Manager, he took the head of R&D development for dry pumps. Current position is now Global Product Manager for all dry pumps at Pfeiffer Vacuum.

Driving Sustainability in a Global Semiconductor Manufacturing Operations

J. O'Sullivan
Corporate Services Global Energy Conservation Manager
Intel Corporation, Corporate Srvices Corporate Sustainability Group, Leixlip, Ireland

Abstract
Intel Corporation is committed to being a leader in environmental responsibility, from resource conservation to addressing long-term sustainability challenges. Intel's approach to green manufacturing includes, but is not limited to the following

− Intel incorporates green design standards and building concepts into the construction of new facilities with a number of Intel's manufacturing facilities being LEED certified.
− Intel maintains a multi-site, 3rd party verified ISO14001 registration which evaluates the effectiveness of its environmental management system at its manufacturing sites.
− Since 2008, Intel Corporation invested more than $118 million to drive energy efficiency in its operations.
− According to U.S. EPA, since 2008, Intel Corporation has been the largest voluntary purchaser of "green" power in the U.S.. In addition, Intel has worked with partners to complete solar electric arrays and has installed solar hot water at a number of its manufacturing sites.
− Over the past two decades, Intel set aggressive GHG reduction goals and worked with others to drive industry-wide improvements.
− Intel works to minimize emissions of volatile organic compounds (VOCs), hazardous air pollutants (HAPs), nitrogen oxide (NOx), and carbon monoxide (CO) emissions.
− Since 2008, Intel has recycled more than 75% of the total waste generated in its operations, while also taking action to reduce the amount of waste generated.
− Intel set and made good progress towards achieving ambitious 2020 environmental goals.
− Intel continues to explore opportunities to design and deliver new technologies to address environmental challenges.

This presentation will outline a number of Intel's achievements in the areas of energy efficiency in our operations, Green Building and LEED Certification, responsible water management, and waste reduction.

Biography
T B A

Management of hazardous process tool exhausts in high-volume device manufacturing

A. Chambers
Senior Product Manager
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Abstract
This paper reviews cost-effective methods for reducing risks associated with hazardous process tool exhausts. Typical risks fall into three categories - flammable process gases, condensed materials in exhausts, and toxic or corrosive gases. Although methods are available to mitigate these risks, their implementation is becoming increasingly inefficient and expensive.

Dilution is widely used to reduce the risk of flammable process gas fires, but this is an intrinsically expensive method. Operational efficiency can be improved by reducing dilution rates, but personnel and equipment should not be exposed to increased risk as a result. To meet this need we propose that process exhaust designs incorporating fully-integrated safety features provide enhanced exhaust system integrity during high volume manufacturing with frequent service activities.

Condensed materials block exhausts, and high pump exhaust pressure may cause seal damage or dry-pump shut-down. When blocked exhaust pipes are removed for cleaning, HF may be released from condensed materials on exposure to air. Furthermore, exhaust pipe fires may be caused by reaction of F2 gas with condensed silicon compounds during chamber cleaning. Exhaust pipe heating is used to avoid blockages and mitigate chemical hazards, and for efficient operation, the temperature management system may be integrated with other exhaust safety features.

Gas leaks from damaged or poorly-maintained exhaust pipes cause equipment damage and harm to staff, and hazardous gas may contaminate the fab. Extracted equipment enclosures can mitigate the impact of gas leaks, but they take clean air continuously from the sub-fab which must be replaced with expensive clean make-up air.

We propose that an integrated approach to process exhaust design, including continuous seal integrity checking, intelligent pipe temperature control and double-contained exhaust pipe joints improves fab safety and environmental stewardship while reducing total cost.

Biography
Andrew Chambers is a Senior Product Manager at Edwards Ltd. He is responsible for commercialisation and product management of new integrated sub-fab process solutions, which deliver industry leading operational efficiencies and low total cost of ownership. He has also served as Technical Manager for Edwards' Exhaust Gas Management Division, where he managed engineering and R&D activities for the semiconductor, flat panel and compound semiconductor business segments. With over 34 years working in the semiconductor industry Andrew has extensive applications experience, having held technical and managerial roles at several process tool and sub-fab equipment OEM companies, including Tokyo Electron Europe Ltd, Surface Technology Systems, Electrotech Group, Lasa Inc. and Oxford Instruments Plasma Technology.

Latest trends in subfab energy consumption reduction and emissions control

A. Neuber
Managing Director Subfab and Environmental Systems
Applied Materials GmbH, Feldkrichen, Germany

Abstract
The availability of energy-saving technologies and products can have a significant positive impact, and they are widely recognized as useful methods to reduce energy consumption. Variable-frequency ICs to drive pump motors are one example. Another is the synchronization of fab and subfab operations to optimize subfab resource consumption with no risk to the manufacturing process or throughput.

Energy savings will assume an even greater importance in the years ahead because the requirements of many regions in these challenging times dictate that power and resource consumption, and emissions, must stay at an even level as production capacity increases. To make matters worse, this is occurring as cost-reduction pressures in all phases of semiconductor manufacturing are stronger than ever.

The good news is that energy conservation, reduction of greenhouse gas emissions (GHGs) and cost reductions do not necessarily contradict one another. For example, the high operating costs to effectively abate environmentally harmful perfluorocarbon (PFC) gases can be reduced by using fab / subfab synchronization systems to reduce resource consumption and generation of typical by-products such as NOx and VOC.

Biography
Andreas Neuber, PhD
Head, Subfab & Environmental Products, Equipment Products Group
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EDUCATION
University of Technology Dresden, Diploma (MS)/Dipl.-Ing./PhD/Dr.-Ing
Chemical Engineering

PROFESSIONAL EXPERIENCE
2011 - Today Applied Materials Head, Subfab & Environmental Products, Equipment Products Group
2008 - 2011 Applied Materials, Managing Director Environmental Services
1991 - 2008 M+W Zander FE, Vice President Manufacturing Technology, Environmental engineering and contamination control consulting
1986 - 1990 University of Technology Dresden, Institute of Chemical Engineering, Research Assistant

Smart and Efficient Use of Energy in Local Energy Systems

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Abstract
Due to continuous rising energy costs, energy efficiency in semiconductor manufacturing is a key issue. In local energy systems energy consumers and producers contribute to the total energy flow. Main energy consumers are the fab infrastructure and tools running either in idle or processing mode. The external energy demand may be influenced by internal energy production based on photovoltaics, combined heat and power plants, demand side management, load shift, storage etc. In this presentation, both areas will be covered: how can tools and infrastructure run more efficient and what energy concepts are applicable and possible. An overview of the energy consumption and potential areas for optimization for the local energy system in a semiconductor manufacturing fab will be also presented.

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